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The Discrimination of Colour.

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(From the Institute of Physiology, University College.)

a paper on the relation of light perception to colour perception,* and in ious writings,† I have stated that if a portion of the spectrum be ted, it will appear monochromatic, the length of the monochromatic n varying with the intensity and wave-length of the light and the colour eption of the observer. Most normal sighted persons make about teen such divisions in a bright spectrum.

a paper in the 'Proceedings of the Royal Society,'‡ Lord Rayleigh, lst agreeing that the facts were as I stated in the conditions described by expressed the opinion that he could distinguish between the wave-ths included in a monochromatic division to the extent of discriminating veen the colours of the two D lines. Lord Rayleigh kindly lent me the ur box with which he had made the experiments, and, on repeating in the manner described by him, I arrived at similar results. I hope, ever, to be able to show that the results obtained by Lord Rayleigh were to the admixture of small quantities of white and coloured light and to ain physiological influences which had not been taken into consideration, which prevented him from arriving at a correct interpretation of the urs.

f a prism, even of the finest polish, be examined with a strong light inst a dark background, numerous small particles and irregularities of the face, which irregularly disperse the light, will be seen. The reflections the sides of the prisms, lenses, and sides of the box have also to be en into consideration. The amount of this irregularly dispersed light is ll, but is a very important factor taken in conjunction with other facts. is necessary, therefore, in order to get rid of the greater part of this gularly dispersed light, to allow the light included in a monochromatic ion to pass through a second aperture, such as that in my spectrometer. en this is done, I have found it impossible by any method which I have pted to distinguish between the various waves included in the monochromatic region. I have magnified the image of this region with eyepiece of different power, making a corresponding increase in the light to make u for the loss of luminosity caused by the magnification. I have also obstructe the central portion of the monochromatic region with a screen, and th remaining portions have still appeared monochromatic. The most conclusiv experiment, however, is the examination of the monochromatic region wit an achromatic double image prism, the intensity of the source of light bein increased as before. By this method two rectangular monochromatic fiel are seen, and can be arranged so that they are side by side and just touc The portion belonging to the red side of the spectrum of one can be made touch the portion belonging to the violet side of the spectrum of the oth This position is therefore most favourable for the detection of any differen and yet I cannot detect any, neither can any other observer to whom I ha shown the experiment. The experiment can be observed objectively in th following manner: An arc light being used for the illuminating sour a pure spectrum is obtained: a portion of this spectrum, forming a mon chromatic region, is allowed to pass through an adjustable slit. Two imag of this monochromatic region can be thrown with the aid of a double ima prism upon a screen and made of any required size. The varying size of t monochromatic regions with different persons can by this means be demo strated to a large number.

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* 'Roy. Soc. Proc.,' B, 1910, vol. 82, p. 458.

† 'Colour Blindness and Colour Perception,' International Scientific Series.

‡ December, 1910.

Another point which I found with Lord Rayleigh's apparatus is t difficulty of obtaining both fields of similar intensity. The slight movement of the eye also causes an alteration in the number and ki of rays which enter the eye. When two fields are of unequal intensi the physiological effect of contrast is evoked, which causes an errone judgment of the colours under observation. In fact, weak orange light m by contrast with bright red light, appear green. In making experiments the discrimination of colour, the rays of light from the two regions to compared should strike the eye at as nearly as possible the same angle; t fixation point of the eye should be in the centre between the two regions, that one region may not be more influenced by the pigment of the yell spot, or the blood in the retina, than the other; and equal amounts of li from each region should enter the eye.

The importance of the irregularly dispersed light in association w contrast in dealing with questions of colour has been overlooked by ma physicists, as several instruments have been constructed for the investigat of colour and colour-vision, which are defective on this ground. It was t irregularly dispersed light, as shown by Helmholtz,* which caused the appar nge in the colours of the spectrum observed by Brewster, and which led n to suppose erroneously that there were three kinds of solar light.

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* 'Poggendorff's Annalen,' 1852, No. 8.

In conclusion, when special means are taken to have as pure a spectrum possible, I can find no method which will enable me to distinguish as tinct colours the wave-lengths in a monochromatic region. I therefore ard the appearance of the monochromatic region as a fundamental physioical fact, as I stated over 20 years ago.

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